Common Insect Pests of Yellow Pine Seedlings

Tennessee Department of Agriculture, Division of Forestry

Pales Weevil and the pitch-eating weevil are major threats to pine plantations. Pales weevil poses the greater problem of the two. It is about 3/8 inch long, is dark reddish brown with scattered yellow speckles, and has a distinctive curved snout and bent antennae.

The larvae live in stumps and slash less than a year old. Adults, not larvae, do the damage. They emerge in early spring and chew down to the inner bark of seedlings, often below the soil line.

The weevil can be controlled by

- Harvesting earlier than July 1. Stumps that weather over the summer are not suitable for weevil grubs. Any area cut prior to July 1 can be planted the next winter.
- Delaying planting of areas cut after July 1. Anything cut after July 1 should not be planted until the second winter. This option deprives the landowner of one year's growth, which is far more costly in the long run than control with insecticides.
- Applying insecticides. Insecticides can be applied mixed with water either as a seedling dip, sprayed at the base of seedlings, or sprayed mixed with kerosene, fuel oil, or (preferably) with basal oil on stumps.

Several insecticides are labeled for pales weevil, but Division foresters have found Pounce® to be the most satisfactory. Seedlings treated with Pounce, while not advertised, may be available upon request from the Tennessee Division of Forestry for $3.00 extra per thousand. Treated seedlings may also be available from some forest industries.

When choosing any other labeled insecticide, make sure it will not wash off easily or break down too soon. When selecting an insecticide, consult your Tennessee Division of Forestry Area Forester or Agricultural Extension Agent for advice.

The Nantucket Pine Tip Moth commonly deforms trees and stunts growth by killing the tips of branches, mostly on trees less than 10 feet tall. The larvae live in the buds and middle of new twigs. Chemical control in plantations is not practical, but cultural measures to reduce the severity of infestation include planting at a close spacing, mixing with other species, diversifying stand structure, and fertilization. Tip moths pose the greatest problem on poor sites.

Red Headed Pine sawflies cause partial to total defoliation. Needles may be partially consumed and turn brown, or they may be entirely consumed. The mature larvae are about an inch long, are yellow with two to four rows of black spots down each side, and a have a red head. Defoliation, even complete defoliation, is seldom fatal. Populations seldom stay at high levels for very long. Rodents and other predators, disease, parasites, and unfavorable weather serve to control the number of sawflies. Damage is worse where trees are crowded, where there is serious hardwood competition, and on poor sites. Infestations are generally spotty, so broadcast spraying of chemicals is not necessary or practical. Physical removal and crushing of clustered caterpillars may be an option. Spot spraying can be done with acephate (Orthene), carbaryl (Sevin) or chlorpyrifos (Dursban). Insecticidal soaps are also effective if the larvae are covered with spray.

Version 4-26-04

Competition Control for Pine Planting on Fields

Tennessee Department of Agriculture, Division of Forestry

Growing pine is like growing a garden or row crop. More crop is produced if weeds are controlled.

Several herbicides control weeds and grasses without damaging pine seedlings. Mixtures can be varied depending on the vegetation to be controlled. These herbicides are sprayed over the tops of newly planted pine seedlings. For maximum effectiveness apply them early in the spring (late March to early April) when the weeds start active growth. Spraying can be done in May or June but much of the effectiveness is lost. A range of concentrations can be used. Higher rates provide longer lasting control at a higher cost.

Herbicide mixes (per acre rates)

- 4 ounces of Arsenal with 2 ounces of Oust. Common mix, provides broad-spectrum control. Cost is about $37 per acre.
- 1 ounce Escort with 2 ounces Oust. Good control of sericea lespedeza. Cost is about $39 per acre.
- 4 ounces Arsenal, 1 ounce Escort, 1 ounce Oust. Controls a wide variety of species including sericea, blackberry and honeysuckle. Cost: $44 per acre.
- 1 quart Velpar, 2 ounces Oust. Controls sericea. Can be sprayed in late February. $33 per acre.

Sericea lespedeza can also be controlled in the fall before planting, allowing use of a wider variety of herbicides (such as Accord, which is Roundup labeled for forestry). However seed will sprout and may require additional spraying.

Spraying can be done over the entire area, in strips, or in spots around each seedling. The strip or spot methods are less expensive. To compare costs among vendors, ask about the rate of chemical applied plus the width of the strip. Strips or spots must be sprayed early. Weeds quickly cover newly planted pine seedlings and grasses and the rows are not easily located. If the rows can't be located, the entire area must be sprayed. Wider strips keep the competition away longer. Sericea reinvades the strips quickly and therefore spraying in strips is risky for control of sericea. Herbicides may be applied by tractor, ATV, helicopter or by hand with a backpack sprayer.

Prior to planting, the area should be bushhogged and burned. This results in a better planting job because the planters can keep up with their rows easier. It also controls weeds better because the herbicide contacts more new vegetation rather than dead vegetation from the previous growing season. If fire is used, some seed is destroyed. (See "Prescribed Fire").

Volunteer hardwoods are present on many old fields. If these are of low value species such as sweetgum or red maple and are numerous, they should be controlled. Hardwoods are best controlled using Arsenal late in the summer or early fall before the leaves turn color. Arsenal does not control legumes or elms well, so a different herbicide should be used if many legumes (locust, redbud) are present. Spray Arsenal directly on the foliage of the hardwoods.

Spraying Arsenal in the spring for weed control will knock back the hardwoods but will not completely control them. Spraying Arsenal in the summer or early fall to control hardwoods also controls weeds, but the weeds are not competing with the seedlings at that time, and the weeds will grow back in the spring. So if both hardwoods and weeds are a problem, two sprays may be needed for best results. But for economy spraying should be targeted to the biggest problem, either weeds or hardwoods.

As with all pesticides, read the label carefully and apply the herbicide as per label recommendations. All necessary precautions should be taken to avoid environmental contamination. Use care near desirable vegetation.

It is recommended that a qualified vendor be hired that can provide the herbicide, labor and expertise to apply it. A list of vendors and/or herbicide suppliers is available from the Division of Forestry.

It is also advisable to subsoil old fields and pastures to allow good root penetration, and to machine plant to make straighter rows. Straight rows are easier to see when applying herbicide.

Version 12-01

Control of Grapevines

Tennessee Department of Agriculture, Division of Forestry

Grapevines can damage trees by breaking tops and limbs, pulling the tree treetops down, by increasing ice storm damage, and by shading the leaves in the tree crowns. Damage is more likely on good to excellent sites than on poorer sites.

Grapevines can be controlled by severing or by basal bark application of an oil-based herbicide. Severing is effective if performed at least four years prior to harvest. That amount of time is necessary to allow shading to kill new grapevine sprouts. Grapevines are intolerant of shade, so although cut vines may sprout prolifically and send up long vines, they will die if the trees above are tall enough, that is, 18 feet in unthinned stands and 25 feet in thinned stands. Cutting vines in shorter trees will result in partial control.

Vines should be cut at least four years before harvest, or basal sprayed, to prevent re-infestation of regeneration. This is especially important if clear-cutting is used because clear-cutting provides the full sunlight grapevines need. When practicing selection harvest or crop tree selection thinning, cut all grapevines if possible. This is because vines can spread from neighboring trees and infest the crop trees.

In some cases a young stand will be so heavily infested that it is entirely covered by vines. In this case chemical control is necessary. Unfortunately, there is no way to kill the vines without also killing the young trees. Studies have shown that good control can be obtained with basal spraying with an appropriately labeled oil-based herbicide, by using a mistblower to apply an appropriately labeled water-based herbicide, or by broadcasting Tordon 10K pellets. Even after chemical treatment, dormant grape seeds will continue to sprout for at least 15 years, making control necessary again when saplings are tall enough.

Grapevines are very beneficial to wildlife. If wildlife habitat is a management objective, a goal of only partial control may be appropriate.

Control of Hardwoods in Cutover Areas

Tennessee Department of Agriculture, Division of Forestry

Pine can sometimes be planted without controlling hardwood vegetation (on poor sites where the timber was cut very cleanly within the last year or possibly two). However, even in this situation control of competing vegetation is a good investment that will result in higher yields and higher returns. Even if the site looks clean now, vegetation will soon grow up and compete with the pine.

In any of the following cases use of herbicide is absolutely necessary in order to establish a pine plantation:

- highly productive soils found in hollows and bottoms
- areas where many cull trees were left standing following the harvest
- areas where it has been several years since harvest and vegetation has grown back

If the area has grown up and is difficult to walk through, it will be very difficult to plant. Fire is effective at clearing thick, low vegetation (such as grass and weeds) but it is not very effective at clearing briars and trees over head high if there is not ample fuel on the ground to support the fire. In these cases it is necessary to bulldoze to clear the brush.

Several herbicides are available for controlling competing vegetation in pine plantations. The most widely used is Arsenal. Arsenal can be applied either before planting (site preparation) or after planting (release). If used as labeled, Arsenal does not harm pines. Arsenal is sprayed in mid-summer to early fall (from July to when leaves start to turn color – about October 15). Because it is applied late in the growing season, results are not highly evident until the following spring.

Velpar is also effective. It is best sprayed before trees are planted. Spray in late spring to early summer and plant the seedlings the following year. ***Velpar*** can also be sprayed after seedlings are planted, but extreme care must be used or the planted trees may be damaged.

Herbicides can be mixed to provide better control in specific situations. For instance, ***Accord*** (***Roundup*** labeled for forestry) may be added to Arsenal to provide broader control and a quick brown-up to facilitate prescribed burning prior to planting. ***Escort*** can be added to Arsenal to control legumes such as black locust or redbud.

The choice between site preparation and release (spraying before or after planting) depends on many factors. Some of the most important are:

- Heavier rates are used for site preparation, which costs more but results in better control
- The best long term release is obtained two growing seasons after harvest. However, during this time the seedlings are subject to competition
- With release there is no delay in planting seedlings
- With release the seedlings can be observed over several years to see if spraying is necessary
- If pine is to be replanted on areas that were previously in pine and the pine was harvested in July or later, planting should be delayed one season to avoid a pest called Pales weevil.

The cost of spraying depends on several factors but most importantly on the amount of herbicide used. High rates are more expensive, but are more effective and long lasting. In 2001 the average cost is $85 per acre

If ground crews are used, ***Arsenal Concentrate*** is mixed with water to form a ½% solution (one pint in 25 gallons). Add a surfactant or penetrant such as ***Cide-Kick, Ortho X-77*** or ***Timberland 90*** to at least a ¼% solution. The foliage of small trees, brush, shrubs and vines is sprayed with this solution not to the point of runoff with a backpack sprayer. Use 12 to 16 ounces of ***Arsenal*** per acre. The amount used depends on the amount of foliage sprayed. A small amount of ***Arsenal*** on pine seedlings will not harm them, but avoid spraying directly on them. 12 ounces ***Arsenal*** with one ounce ***Escort*** is a good combination.

All vegetation too large for at least 2/3 of the foliage to be sprayed should be injected with arsenal or other appropriate herbicide (see "Hack and Squirt"). This can be done at any time, but is least effective in December to mid January, during spring sap flow, and during drought. If many large trees are present, it may be better to spray with a helicopter. One advantage of ground application, though, is that trees can be selectively spared for wildlife and visual purposes.

Rates for helicopter spraying for site preparation are at least 24 ounces per acre of ***Chopper*** (a formulation of ***Arsenal***) and for release, 12 to 16 ounces ***Arsenal***.

As with all pesticides, read the label carefully and apply according to recommendations. All necessary precautions should be taken to avoid environmental contamination.

It is advisable to hire a qualified vendor that can provide the herbicide, labor and expertise to apply it. A list is available from the Division of Forestry.

Pesticides recommended in this publication were registered for the prescribed uses when printed. Should a registration be cancelled, the Division of Forestry would no longer recommend it. Use of trade or brand names in this publication is for clarity and information: it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. Landowners are encouraged to contact district representatives of the companies that sell herbicides in their area.

Version 12-01

Decay in Forest Trees

Tennessee Department of Agriculture, Division of Forestry

Decay destroys more wood each year than all other factors combined, and makes up over ¾ of all losses to insect and disease. Decay is introduced to trees by means of

- fire scars
- broken limbs
- insect entry
- logging wounds
- trampling by livestock
- sprouts growing from upper portions of tall stumps

Fire scars and broken tops are the leading causes of decay

Decay is most damaging when it occurs at the base of the tree, since the butt log is generally the most valuable.

To prevent and minimize decay

- Prevent fires and reduce the amount of burnable material
- Thin young stands to help reduce breakage of spindly trees during storms, and to strengthen trees against insect attack
- Maintain a diverse forest, which is more resistant to insect and disease outbreak
- Harvest mature trees before losses to decay exceed growth
- Cut low stumps
- Remove trees with signs of decay or with major injuries
- Use "bumper trees" along skid trails to absorb the impact of logs being dragged past, then remove the bumper trees
- Exclude livestock from the woods
- Harvest and regenerate mature forests with a large proportion (40%, perhaps) of trees showing decay symptoms
- Perform timber stand improvement in young stands

Young trees usually have less decay than old trees and are better able to resist decay once it is introduced. **Sapling and pole timber can be thinned**, taking less desirable individuals:

- Injured or decayed
- Poorly shaped (bent, spindly, etc.)
- Less valued species
- Over-topped
- Crowded
- All but the single best sprout on a stump (lowest, healthiest)

Signs of decay and approximate percentage chance of decay being present include

- Mushrooms or "conks" growing from tree trunks (100%)
- Open fire scars (99%)
- Closed fire scars (60+%)
- Dead or damaged tops (60%)
- Unsound branch stubs (30%)
- Mechanical injuries (25%)
- Healed-over large branch stubs (20-25%)
- Sound branch stubs (10%)
- Swellings (10%)
- Vertical scars ("rolled-in" scars are most serious)
- Cankers
- Oozing
- Sound branch stubs

Fresh wounds at high risk of decay include

- Broken main stems
- Branch stubs greater than 3" in diameter
- Wounds deeper than 2"
- Wounds within 16" of the ground
- Bark removed from areas of one square foot
- Stump sprouts originating high on the stump
- Exposed or damaged roots

Fire was once a leading cause of decay. Fire defense is not easy, but some options include:

- Prescribed fire to reduce the intensity and rate of spread of wildfire. Prescribed fire is normally used in pines larger than 5" in diameter and 30' tall. Under-burning in hardwood forests is still experimental and is not recommended
- Maintain roads and plowed trails as fire breaks and access routes
- Thin pine stands to reduce fuel loading and improve access
- In high-value hardwoods, saw fallen trees into pieces to reduce fire intensity and aid decomposition

Version 8-00

Grazing in Forests

Tennessee Department of Agriculture, Division of Forestry

Permitting grazing in the woods offers only one real benefit to livestock (shade) but has many drawbacks:

- Continuously grazed woodlands offer little or no nutrition
- Cattle can be poisoned from feeding on red-oak acorns and wilted cherry leaves
- Grazing compacts soil and exposes it to erosion
- Livestock destroy wildlife cover and compete for food
- Grazing lowers timber value (wood stain, decay, brittleness, warping, and slowed tree growth due to soil compaction and root damage)
- Grazing tends to eliminate desirable forest tree reproduction

Deer and turkey cope well with grazing because they have few predators and can travel long distances. Small and non-game species suffer from lack of cover in heavily grazed areas.

Options include:

1. Fence livestock out entirely
2. Put the fence 30 feet into the woods to allow shading for livestock
3. Fence (a) small enclave(s) of 5-10 white oak and hickory (harmless to cattle) for shade
4. Make "cover islands" in grazed woods by fencing areas 50-60 feet across, then planting wildlife food/cover plants or allowing the areas to grow back naturally
5. Create "tree barns" by planting (a) small grove(s) of trees in the pasture
6. Run fewer head of livestock
7. Rotate grazing

Grazing rotations can vary from every week to every season. If seasonal, consider establishing warm and cool season pastures. The goal in woodland rotational grazing should be to graze vegetation to no less than six or eight inches tall.

Version 1-00

Hack and Squirt

Tennessee Department of Agriculture, Division of Forestry

Hack-and-squirt herbicide injection is a cheap and easy way to kill undesirable trees. It can be used alone or in combination with other vegetative control methods for

- Natural regeneration
- Crop tree release
- Timber stand improvement
- Stand conversion
- Cull tree removal
- Creating cavity trees for wildlife

Equipment needed:

- Small sharp ax or hatchet
- File for sharpening
- Quart capacity trigger-activated squirt bottle (1 ml/squirt) with chemical resistant seals
- Safety glasses
- Rubber gloves
- Chainsaw chaps

Commercial squirt bottles are available at auto supply stores, chemical supply catalogues and forestry equipment suppliers.

Wear personal protective equipment as specified on herbicide label.

Cut into the tree at a height that is comfortable for you. Strike the tree at a downward angle. Be sure the cut penetrates into the sapwood. Each cut must form a pocket that will hold the herbicide. Spilled herbicide is wasted unless it stays in the cut. Space the cuts evenly around the stem according to the label directions (see below). Squirt one "shot" into each cut.

When treating stump sprouts, inject each stem in the clump. Try to make cuts below the crotch of low forks. Some species such as sugar maple, hickory and chestnut oak have thick bark that is hard to penetrate and may require more cuts.

When preparing a site for natural regeneration, inject only trees of non-desirable species. Cut down non-merchantable trees of desirable species so that they will regenerate from stump sprouts.

Hack-and-squirt can be done in any season. However, spring sap flow can push out the herbicide. Frozen trees should not be treated. When hard freezes occur at night, antifreeze may be added according to label directions.

Herbicides for hack & squirt to control hardwoods (always follow directions on the label.)

Garlon 3-A/Arsenal mix works well on a broad range of hardwoods. Mix one part *Garlon 3-A* with three parts water, plus six ounces of *Arsenal AC* per gallon of mix. Make cuts around tree with ends of cuts one inch apart.

Tordon RTU: No mixing required – use full strength. Comes with a dye to help monitor application. Space cuts with two or three inches between cut ends. Can be used on stump cuts to prevent resprouting. Red maple is somewhat resistant.

Pathway: Another type of *Tordon.* Use full strength. Comes with a dye. Space cuts same as *Tordon*. Can be used to treat surfaces of cut stumps.

Arsenal AC: One part *Arsenal* to nine parts water. Hack once for every three inches of tree diameter (a 12 inch diameter tree will require four hacks.) Slow acting – may take two years to kill. Less effective on black locust, honeylocust, blackgum and redbud.

To control pine and red-cedar, use full strength *Garlon* with the ends of cuts two inches apart.

Sources for forestry herbicides and equipment

Local Farmers Cooperatives

Forestry Suppliers, Inc.
205 West Rankin St
Jackson MS 39201 1-800-647-5368

Ben Meadows Company
3589 Broad Street
Atlanta GA 30341 1-800-241-6401

UAP Timberland LLC
PO Box 557
Monticello AR 71655 1-870-367-8561
www.timberlandenterprizes.org for sales

Chemical Containers, Inc.
PO Box 1307
Lake Wales FL 33859 1-800-346-7867

Version 11-03

Hemlock Wooly Adelgid

Tennessee Department of Agriculture, Division of Forestry

(Excerpted from University of Tennessee Bulletin SP503-G)

The hemlock wooly adelgid is an exotic pest of hemlock that kills most of the trees it infests. This pest is spreading from northeast Tennessee at a rate of about 15 miles per year. It looks like little puffs of cotton at the base of needles.

The only practical control method in forest situations is to introduce an imported predaceous lady beetle. Even so, the best that can be hoped for is a moderate level of control. The commercial supply of this beetle should come closer to meeting demand with the establishment of a rearing facility at the University of Tennessee in 2004. The use of chemical control can maintain hemlock stands until this beetle can become established. Ground and foliar chemical control cannot be used near streams.

Residential trees can be treated with horticultural sprays or oils, or with the insecticide imidacloprid (Merit), which is marketed for homeowners as Bayer Advanced Tree and Shrub Insect Control Concentrate.

Relative to most other insecticides, insecticidal soaps and oils have fewer potential adverse effects to the user, with minimal harm to beneficial predators, parasites and the environment. Complete coverage is needed for effective control, so a high-pressure spray is necessary. A high level of control is possible with just one spray. Evaluate a week after spraying to see if a second spray is needed.

Horticultural oil may cause some needle burn when applied during the growing season, especially during hot, dry weather. For this reason, a 1 percent solution of horticultural oil is recommended from May through September, while a 2 percent solution can be used from October to April. Insecticidal soap sprays may occasionally cause some browning of tender new foliage. It is best to not apply horticultural oil or insecticidal soap if the temperature exceeds 90 degree F. or drops below 45 degrees F. Spraying trees with horticultural oil or insecticidal soap before the trees are infected does not act as a deterrent to HWA infestation.

Merit can be used as a foliar spray, applied in the root zone either as a soil drench or soil probe injection, or injected directly into the tree trunk. Foliar Merit sprays can be made on trees away from sources of water. Timing of Merit sprays is best between mid-May and mid-June, and again between late July and October.

The root zone or trunk injection methods are much longer lasting than the foliar application, and the level of control is generally better. One application to the root zone or the trunk can potentially provide a year or more of control.

After treatment, reinfestation by HWA should be a concern. Expect reinfestation to occur sooner if untreated HWA-infested hemlock trees are nearby. Even if reinfestation occurs within a year of a root or trunk treatment, higher pest levels that seriously reduce tree growth may not occur until the end of the second year.

Soil applications of Merit by drenching or soil injection should be made between late August and early December or from mid-March to mid-June. It may take two to three months for the insecticide to move up into the foliage of a medium-sized tree. Moist soil prior to treatment and for seven to 10 days after treatment is needed to optimize uptake. Use rates are determined by the diameter of the tree trunk. It should be emphasized that trees heavily infested with HWA or those in poor vigor may not be as effectively treated as more vigorous trees. Merit is not labeled for use as a root zone application in forests. The trunk injection methods are only available for application by specially trained landscape professionals.

In landscape and nursery crop situations it is practical to rely heavily on chemical control to eradicate this pest. In the forest situation, it is much more difficult and expensive to treat all the infested hemlock trees. Forest managers and park officials should make decisions on which trees to treat in forest settings based on tree stand values and land management objectives.

It is important to prevent the introduction of this pest into new areas. Inspect new landscape or nursery hemlock trees before planting or selling. Use care when moving plants, firewood and other outdoor items from infested areas, especially from March to June when HWA eggs and crawlers may be present. If possible, try to keep people out of infested areas, since HWA can be transferred on clothing. Animals may also help disperse this pest. Do not place birdfeeders in hemlocks; use noisemakers, fake owls or snakes to discourage birds from landing in infested trees.

Maintaining good growing conditions will improve survival of hemlocks. Water trees during periods of drought. Apply light amounts of balanced fertilizer to uninfested trees. Do not fertilize infested trees, since it makes the infestation worse.

Infestations often start in large, mature hemlocks but can also start in other size trees. If these trees cannot be treated, their removal will retard the establishment of new infestations. Clipping heavily infested branches will reduce HWA numbers on individual trees, but extensive clipping may hurt the appearance and health of a tree. Removal of dead or dying branches will allow more light to reach the foliage and promote good tree health. Pruned branches should be properly discarded or destroyed so as to not spread the infestation to other areas.

Consider not planting hemlock in or near an infested area. Although nothing can replace hemlock in a forest setting, a number of evergreens, including white pine, Arizona cypress, Leyland cypress and eastern redcedar are available for landscape use.

Kudzu Control

Tennessee Department of Agriculture, Division of Forestry

Kudzu shades out all competitors and is difficult to control. Taproots occur every several feet in infested areas, and nodes on vines readily take root. Taproots grow as deep as 9 feet, and can weigh several hundred pounds. They store large amounts of starch which give the plant a tremendous ability to resprout.

Dense vines mask both safety hazards and kudzu "crowns" (tops of taproots). It is highly advisable to clear away vines before proceeding. If logging kudzu-draped trees, do it a year ahead of treatment, and log in winter if possible to avoid spreading the vines.

Several options for eradication are available. A combination of measures may be most effective. Eliminating kudzu requires constant vigilance, since this vine grows as much as a foot per day, and birds spread its seeds.

Area treatments

Prescribed burning. Careful use of fire in the winter will clear the ground and make treatment much easier. Take care. Kudzu forms loose, fine fuel beds up to several feet deep, and provides "fuel ladders" into tree crowns. Pre-treatment logging will eliminate this risk.

Broadcast herbicide application. The most effective herbicide available for kudzu control is Tordon:

Kudzu less than 10 years old

- Tordon 101 (picloram + 2,4-D) @ 1 gal/acre
- Tordon K (picloram) @ ½ gal/acre
- Tordon 101 @ ½ gal/acre + Tordon K @ 1 qt/ac

For kudzu more than 10 years old, double these dosages. Spray when actively growing, no earlier than early June. Apply when the wind is calm and within 2-5 days of rain. *Warning: Tordon moves off-site easily during rain, especially on steep slopes, and is highly toxic to fish. Do no apply near water (see label on product).*

Tordon is a restricted-use pesticide. Applicators must be licensed. Landowners can be certified and apply for a permit to purchase Tordon at the County Extension Office. ALL PESTICIDES MUST BE APPLIED EXACTLY ACCORDING TO THE LABEL.

Transline is also highly effective against kudzu. It has the added advantage of killing only a narrow range of species. Apply Transline when vines are actively growing but after the spring growth spurt (mid-summer to early fall) according to the label.

Other herbicides labeled for kudzu:

- Escort (metsulfuron) 3-4 oz/ac when actively growing; can be used safely in infested pine stands
- Banvel 720 (dicamba + 2,4-D) 2-3 gal/ac, mid-July through October; add 2 qt/gal non-ionic surfactant
- Garlon 4 (triclopyr) 1-2 gal/ac, May through September, except during drought
- Krenite (fosamine) 1.5-3 gal/ac, apply in Aug-Sept; add 1 qt/100 gal non-ionic surfactant + a drift control agent
- Accord (glyphosate) 1 gal/ac when actively growing; ***can be used near water***

Spike, Spike 20P and Spike 40P are highly effective herbicides for use along fences, where kudzu is often oldest and most entrenched. Banvel 4-L and Crossbow are labeled from treating pastures.

Repeat spraying in a year to kill emerging dormant sprouts. Spot treat for as long as necessary thereafter (3 up to 10 years).

Herbicides can be applied by tractor or by backpack sprayer. Tractors are not useable on steep or unknown terrain, and backpack sprayers are very difficult to use in vines over 2' deep.

Mix as per the label. Application rates to 40-60 gallons per acre have been tested; no difference in effectiveness was found.

Apply in cross-hatched pattern with strips slightly overlapping. Near streams, follow the contours of the land in parallel overlapped strips. Use only herbicides approved for use near water (that is, Accord) in riparian zones (areas adjacent to streams).

Grazing. Kudzu provides excellent high-protein livestock forage. Overgrazing depletes starch reserves in taproots, thus weakening the plant. Supplement with other feeds as kudzu disappears.

Chopping, mowing or disking. Repeat every 2 weeks as vines emerge in the spring.

Spot treatments

Grubbing. Dig tubers out by hand. This works best for small infestations of young plants.

Spot spray. Use a backpack sprayer to spot apply a solution of 1 pint/4-5 gal Tordon 101, or ½ pint Tordon K/4-5 gal water. Other herbicides are also affected. Use according to label.

Chop/paint root crowns. Chop into root crowns, paint on a 50% solution of glyphosate (Accord) or triclopyr (Garlon 3A).

Cut large vines & paint stumps. Use on well-established vines around non-target plants and where vines are growing into tree tops. Cut vine 2" above ground and paint with a 25% solution of either glyphosate or triclopyr. Apply when temperature is greater than 40 degrees and 60 degrees, respectively.

Place an opaque impenetrable object over the crown. This might be the simplest, cheapest, most effective way to control small infestations. First burn off the dead vines. Cover each crown with an opaque object, such as an asphalt shingle, black plastic sheeting, heavy black garbage bag, or sufficient layers of cardboard. Weight down so that no light gets in and the covering will not blow away.

Persistence is the key. It may take up to 10 years to find and eradicate every sprout, and constant effort is required to combat invasion from neighboring property.

Version 10-05

Oak Decline

Tennessee Department of Agriculture, Division of Forestry

Oak decline is weakening and killing increasing numbers of large mature oaks in Tennessee, especially the red oak group. Oak decline is a gradual weakening of the tree over several years followed by death. Outer branches die and leaves grow only near the trunk. Oak decline is not well understood but is thought to be a complex mix of tree age, site, location, weather, soils, fungi and insect attacks. This disease will become more common as these forests continue to mature.

Oak decline is normal in aging upland hardwood forests. Dieback and death is an expected result when physiologically mature oaks come under stress.

Management Options – Short Term

Landowners have several options to promote healthy hardwood forests including oak. These can be customized to suit any forest, depending on the amount and distribution of dead and unhealthy trees.

Cut and sell declining red oaks and other oaks, especially red oak borer brood trees. Cutting these trees along traveled roads, trails or in recreation areas will reduce hazards to people.

Remove mid-story trees of less desirable competing trees to encourage growth of oak seedlings and saplings.

Cut small (approximately ½ acre) groups of trees. The combination of more sunlight striking the ground and possibly heavy acorn crops from stressed trees in small areas of severe oak decline can increase the number and success of oak seedlings.

Cut patches or whole stands where heavy decline and mortality are widespread, to give oaks a better opportunity to re-grow from stump sprouts and to give oak saplings the sunlight they need to thrive.

Use prescribed fire to encourage growth of oak seedlings in mature stands and to reduce the number of less fire-tolerant competitors.

Management Options – Long Term

For areas with less severe mortality/decline and areas that may be vulnerable to decline, the following options may be useful

Improve the existing forest. Selectively cut smaller trees from the mid-story, thin the forest by cutting out some of the larger trees, and even use prescribed fire to develop oak seedlings and saplings. These treatments also reduce the number of less desirable competitors. Where appropriate, cut red oaks in favor of quality stems of less susceptible trees like white oaks and hickory.

Start a new forest. Cut all trees in declining areas if there are enough well-distributed and well-developed oak saplings (10 feet tall) in the understory.

Low risk forests

Adequate growing-season moisture
No recent spring defoliation
Physiologically immature (Pole-size, <50 years old)
Mostly white oaks
"Rich" site (site index >70)
Mesic (moderate) site conditions
Deep (>18") loamy soils, few rocks
Coves, terraces, bottoms, lower slopes
North and east aspects

High risk forests

Acute summer drought for 2-3 yrs
Recent spring defoliation
Physiologically mature (sawtimber, >50 years old)
Predominantly red oak group
"Poor" site (site index <70)
Xeric (dry) site conditions:

- Shallow (<18") rocky soils
- Ridges or upper slopes
- South and west aspects

Version 5-01

Security

Tennessee Department of Agriculture, Division of Forestry

Trespassing, liability and theft pose risks from

- Nuisance and littering
- Destruction of property
- Timber theft
- Safety of trespassers
- Potential for lawsuits
- Illegal uses of your land

There is no simple solution to these problems, but the following steps will minimize the risk. These are basic measures that any prudent landowner should take, and are not intended to be legal advice.

Trespassing

- Mark boundaries and put up clear signage.
- Control access to your property. This might be a perimeter fence or segments of fence, logs etc across important access points.
- Lease the land to someone who will take an interest in it and help patrol it.
- Visit/patrol your property as often as possible. Report any illegal use of your land immediately to law enforcement officials. (This could help you avoid legal problems.)
- Work with other landowners to have a "neighborhood watch."
- Don't take the law into your own hands!

Liability

- Prevent access by children to "attractive nuisances," (caves, bluffs, dilapidated buildings, etc.)
- Do not let your debris fire escape. You are liable for damages if it escapes to a neighbor's property
- When leasing land to hunters,
  1. Show them any hazards on the property
  2. Indicate hazards on a map, along with property boundaries
  3. Prepare a written agreement outlining rules of safe conduct and property protection
  4. Have each hunter sign a copy of the map, the rules, and the release, together with a statement that he/she has read and understands them
  5. Consider requiring the leasee to purchase liability insurance, or purchase it yourself; insurance can be purchased through the Southeast Wildlife Federation and the National Rifle Association

Each liability situation is different. If you have special concerns or problems with your liability exposure, contact an attorney.

Timber theft may occur intentionally and surreptitiously, or unintentionally by a logging contractor operating on neighboring property.

1. Know your neighbors and work with them if possible
2. Patrol your property often
3. Lease your property to reputable users (such as hunters)
4. Carry out reforestation after a timber sale (if desired) as soon as possible so that you can close off the area
5. Consider the possibility of timber theft in long-range management planning, harvesting stands of highest value and accessibility first

To avoid inaccuracy or cheating by a timber harvester with whom you have contracted

1. Use a consulting forester
2. Mark boundaries clearly
3. Know what you are selling
4. Get references from other landowners who have done business with that contractor
5. Write a clear and legally binding contract covering all aspects of the sale
6. Inspect the harvest frequently
7. On per-unit sales, monitor loads and assure timely settlement and ticket reporting
8. Compare pre-sale estimates of income to final total

If you sell timber on shares or pay-as-cut, you can be held liable for damaged caused by the logs on the way to the mill. Lump sum sales avoid this problem, since the purchaser owns the timber before it is cut and transported.

Version 12-01

Southern Pine Beetle

Tennessee Department of Agriculture, Division of Forestry

Southern pine beetle (SPB) is a serious pest of yellow pines, including loblolly, shortleaf and Virginia pines.

SPB adults lay eggs under the bark. Larvae hatch and eat the inner bark, thus cutting off the supply of nutrients to the roots. These beetles also bring with them blue stain fungus that plugs the tree's water conducting tissues. Once several SPB have attacked a tree, it cannot be saved.

When SPB adults emerge, they fly to a nearby tree and lay eggs. Adults are attracted to weak, stressed trees.

SPB attacks the central portion of the trunk, usually between heights of 10 and 40 feet. Trees shorter than 10 feet are generally not attacked.

Trees are most susceptible when they are weak from drought, crowding, injury, old age and attacks by other pests.

A SPB is about the size of an uncooked grain of rice (1/8"). The interwoven "S"-shaped pattern of trails left by the larvae on the inside of the bark are distinctive.

Symptoms in order of appearance:

√ Small amounts of powdery residue in bark crevices, spider webs, etc.
√ Blobs of pitch the size of popcorn
√ Yellowing foliage that turns red, then brown
√ Loose bark with distinctive sinuous feeding tracks of the larvae

Time is of the essence when infestations are spotted. There are two methods of dealing with SPB: cut-and-leave, and salvage.

For cut-and-leave, fell all trees showing any symptoms toward the middle of the infested area. Also fell any healthy trees that are within at least one tree length of the spreading side(s) of the spot. Leave tops on trees to draw water out and thus inhibit larvae from developing.

Salvaging timber in an epidemic may be problematic since markets could be flooded with pine.

If multiple spots are involved, place the highest priorities on spots having the greatest

1. Number of freshly attacked trees
2. Density (basal area) of stand
3. Size of trees

Check spots after a couple of weeks to make sure they are not spreading.

To prevent attacks, maintain a healthy forest.

- Thin crowded stands
- Remove weak and diseased trees
- Harvest and regenerate mature and over-mature stands
- Minimize soil compaction during logging
- Maintain habitat for predators of the SPB, especially woodpeckers.

Permethrin is the only pesticide labeled for treating yard trees for SPB, but it must be applied often and is not highly effective. Prevention is the only realistic alternative: mulch, water and fertilize trees to maintain vigor.

Version 7-01

Sudden Oak Death

Tennessee Department of Agriculture, Division of Forestry

Sudden oak death (SOD) first appeared in California in 1995. This imported fungus has killed tens of thousands of oaks in California. In addition, it lives on a variety of shrubs such as huckleberry , viburnum, and rhododendron. This pest poses a substantial risk to eastern forests. Many eastern oaks, especially northern red and pin oaks, are highly susceptible. So far the pest has been confined to California and southwest Oregon, but it could be spread to the East by transport of ornamentals.

Stem cankers occur on oaks. Cankered trees may survive for one to several years, but once crown dieback begins, leaves turn pale yellow then brown within a few weeks. A black or reddish ooze often bleeds from the cankers, staining the surface of the bark.

Dead tissues surrounded by zone lines are usually found under affected bark. Because these symptoms can be caused by related fungi, laboratory tests must be done to determine pathogen identity.

Symptoms are similar to other oak problems: canker rots, slime flux, leaf scorch, root disease, freeze damage, herbicide injury, and others. Oak wilt, oak decline, and the red oak borer are potentially the most confusing.

Oak wilt does not cause stem cankers or bleeding. Dark staining may be evident under the bark of trees with oak wilt, but there are no conspicuous zone lines. Oak wilt typically causes red oak leaves to turn brown around the edges while the veins remain green, and leaves are rapidly shed as the tree dies. Conversely, in SOD the veins first turn yellow and eventually brown. Leaves are often retained on the tree after it dies.

Oak decline shows evidence of dieback over several years from the top down and the outside in. Dieback from SOD occurs over a growing season or two. In oak decline, the staining from borer wounds has a discrete margin with no zone lines or evidence of canker development beyond the attack site.

With red oak borer, the inner bark beneath the dark stain contains a frass-packed burrow and has a discrete margin with no zone lines or evidence of caner development beyond it.